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DRAFT

Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM₁₀) Concentration Events in the Buckeye Area on July 1, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts for Phoenix and surrounding areas as part of their Natural Events Action Plan. On Monday June 30, 2008 ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast calling for a moderate risk of wind-blown dust for Tuesday July 1st in Maricopa County. This was due to the potential for thunderstorms developing over the Mogollon Rim and tending to drift toward the desert areas in the evening with gusty outflow winds and the potential to produce areas of dense blowing dust. The forecast did mention the possibility of strong gusty winds in excess of 25 mph in Maricopa County due to outflow from even distant thunderstorms. This potential wind-blown dust event equated to a moderate risk of exceeding the PM₁₀ National Ambient Air Quality Standards (NAAQS) in Maricopa County. The forecasts/advisories satisfy the requirement in 40 CFR 51.920(a)(1).

Strong northeasterly winds associated with an outflow boundary coming off the Rim were observed on July 1,

2008 during the late afternoon and early evening. The initialization of the wind-blown dust event is evident in the Phoenix visible camera images, the satellite imagery, as well as in the Arizona Meteorological Network (AzMET) and National Weather Service (NWS) monitor data (see Fig. 1). All appropriate State Implementation Plan (SIP) control measures were in place during the event demonstrating, per 40 CFR 50.1(j), that the event “is not reasonably controllable or preventable.”

The significant wind event brought elevated ambient concentrations of PM₁₀ to the Phoenix area that exceeded the NAAQS at the Buckeye monitor operated by Maricopa County. The fact that ambient concentrations exceed the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event “affects air quality.”

The following are the key PM₁₀ monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM ₁₀	1-hr Max PM ₁₀	Max Time	Flag**
BUCKEYE AREA					
Buckeye (Maricopa Co.[MC]/TEOM)	04-013-4011*	172	2327	1800	A or RJ
PHOENIX METRO AREA					
West 43 rd Ave (MC/TEOM)	04-013-4009*	76	268	1900	None
Durango Complex (MC/TEOM)	04-013-9812*	60	182	1900	None
Greenwood (MC/TEOM)	04-013-3010*	59	163	1900	None
Higley (MC/TEOM)	04-013-4006*	46	168	1600	None
West Phoenix (MC/TEOM)	04-013-0019*	54	148	1900	None
Central Phoenix (MC/TEOM)	04-013-3002*	50	129	1900	None
JLG Supersite (ADEQ/TEOM)	04-013-9997*	42	108	1900	None
Coyote Lakes (MC/TEOM)	04-013-4014*	119	697	1800	None
South Phoenix (MC/TEOM)	04-013-4003*	55	188	1700	None

* EPA Air Quality System Identification Number

** 24-hr PM₁₀ concentration influenced by natural or exceptional event to be flagged.

Type Abbreviations: BAM – Beta-Attenuation Mass Monitor (Continuous monitor)

TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor).

The preliminary findings from this analysis were presented at a stakeholders meeting on November 19, 2008, in Phoenix, Arizona. Following this stakeholders meeting, ADEQ will finalize this demonstration and solicit public

comment on the final demonstration. Any comments that are received will be forwarded to EPA with this demonstration pursuant to 40 CFR 50.14(c)(3)(i).

NWS-Deer Valley							
Hr	T(F)	VR	Dust	Spd	Gust	Dir	
1	93	10		6	6	NE	
2	92	10		6	6	E	
3	92	10		0	0	N	
4	91	10		3	3	NE	
5	88	10		0	0	N	
6	88	10		0	0	N	
7	92	10		5	5	N	
8	95	10		6	6	E	
9	99	10		9	9	SE	
10	101	10		9	9	SE	
11	102	10		14	21	S	
12	103	10		0	0	N	
1	106	10		9	9	SW	
2	108	10		11	17	SW	
3	107	10		0	0	N	
4	108	10		5	5	VR	
5	104	10		20	31	NE	
6	101	10		14	22	NE	
7	100	2	HZ	30	44	N	
8	102	9		25	49	N	
9	106	9	SO	32	47	NW	
10	98	10		9	9	E	
11	96	10		7	7	SE	
12	92	10		0	0	N	

NWS-Luke AFB							
Hr	T(F)	VR	Dust	Spd	Gust	Dir	
1	89	10		7	7	N	
2	87	10		3	3	NE	
3	89	10		0	0	N	
4	87	10		8	8	NE	
5	89	10		0	0	N	
6	83	10		3	3	NE	
7	90	10		5	5	N	
8	95	10		5	5	NE	
9	100	10		15	15	E	
10	100	10		10	10	E	
11	103	10		5	5	VR	
12	105	10		7	7	VR	
1	107	10		15	15	SW	
2	108	10		13	13	SW	
3	109	10		13	21	SW	
4	110	10		13	13	SW	
5	110	10		10	17	SW	
6	104	5		26	32	NE	
7	102	10	BLDU	24	37	NE	
8	N/A	N/A	N/A	N/A	N/A	N/A	
9	99	10		7	7	NW	
10	99	10		10	10	SE	
11	95	10		7	7	SE	
12	94	10		6	6	SE	

BUCKEYE							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	88	25	-	3	3	N	
2	89	29	-	2	12	E	
3	84	34	-	2	5	E	
4	81	46	-	3	6	SE	
5	80	46	-	3	5	E	
6	79	49	-	2	4	SE	
7	85	35	-	1	4	N	
8	91	37	-	3	6	SE	
9	94	34	-	5	9	SE	
10	98	29	-	4	8	SE	
11	101	20	-	4	8	SW	
12	103	18	-	4	10	SW	
1	105	18	-	6	11	SW	
2	107	15	-	7	12	SW	
3	109	13	-	7	12	SW	
4	111	11	-	7	14	W	
5	111	11	-	7	13	SW	
6	109	18	-	4	6	S	
7	104	15	-	17	29	E	
8	100	16	-	6	21	NE	
9	91	29	-	3	7	S	
10	89	31	-	2	4	SE	
11	89	29	-	3	6	E	
12	86	31	-	4	9	E	

Event Contrib. Analysis			
Hourly PM ₁₀ Conc. (µg/m ³)			
MONITORS:	Hr	1	
1-Buckeye			
	1	59	
	2	58	
	3	61	
	4	62	
	5	53	
	6	122	
	7	178	
	8	125	
	9	101	
	10	64	
	11	57	
	12	42	
	1	53	
	2	52	
	3	35	
	4	37	
	5	35	
	6	27	
	7	2327	
	8	364	
	9	66	
	10	59	
	11	75	
	12	39	

24-Hr. Avg PM₁₀ 5 53

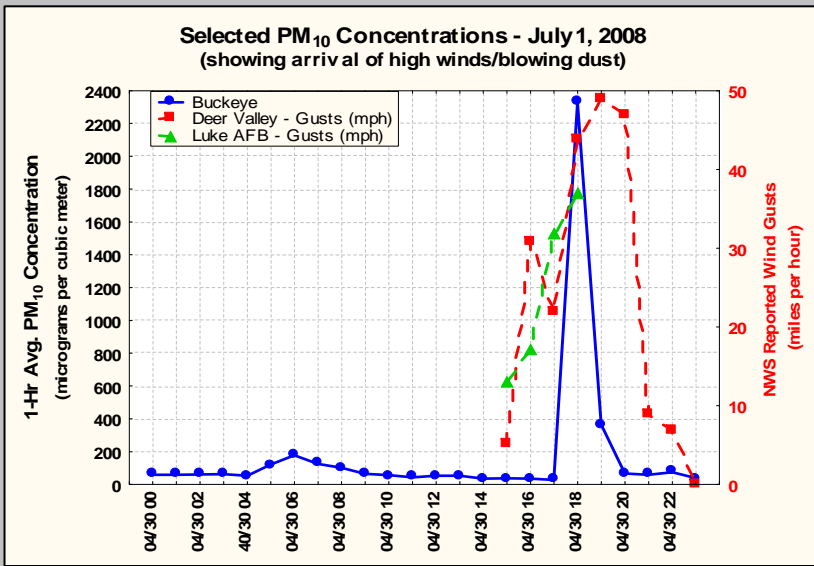
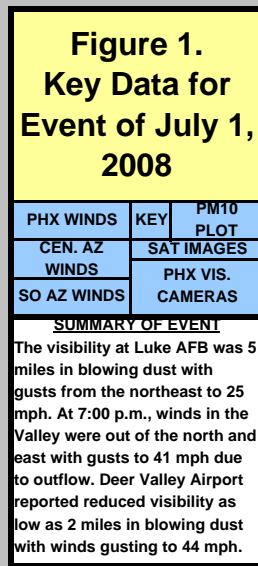
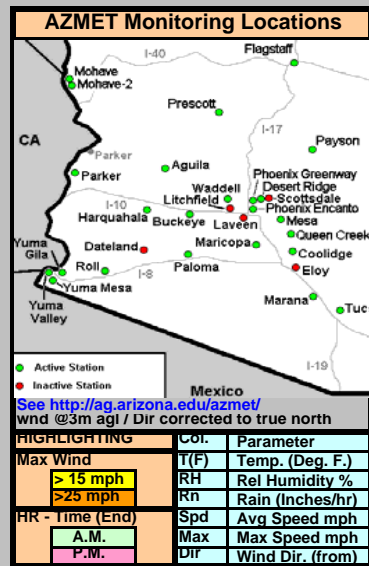
Monitor: Event Even

1-Buckeye 172 66

> NAAQS < NAAQS

Pink=Event Contrib.

Conclusion: As shown above, the PM₁₀ concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).



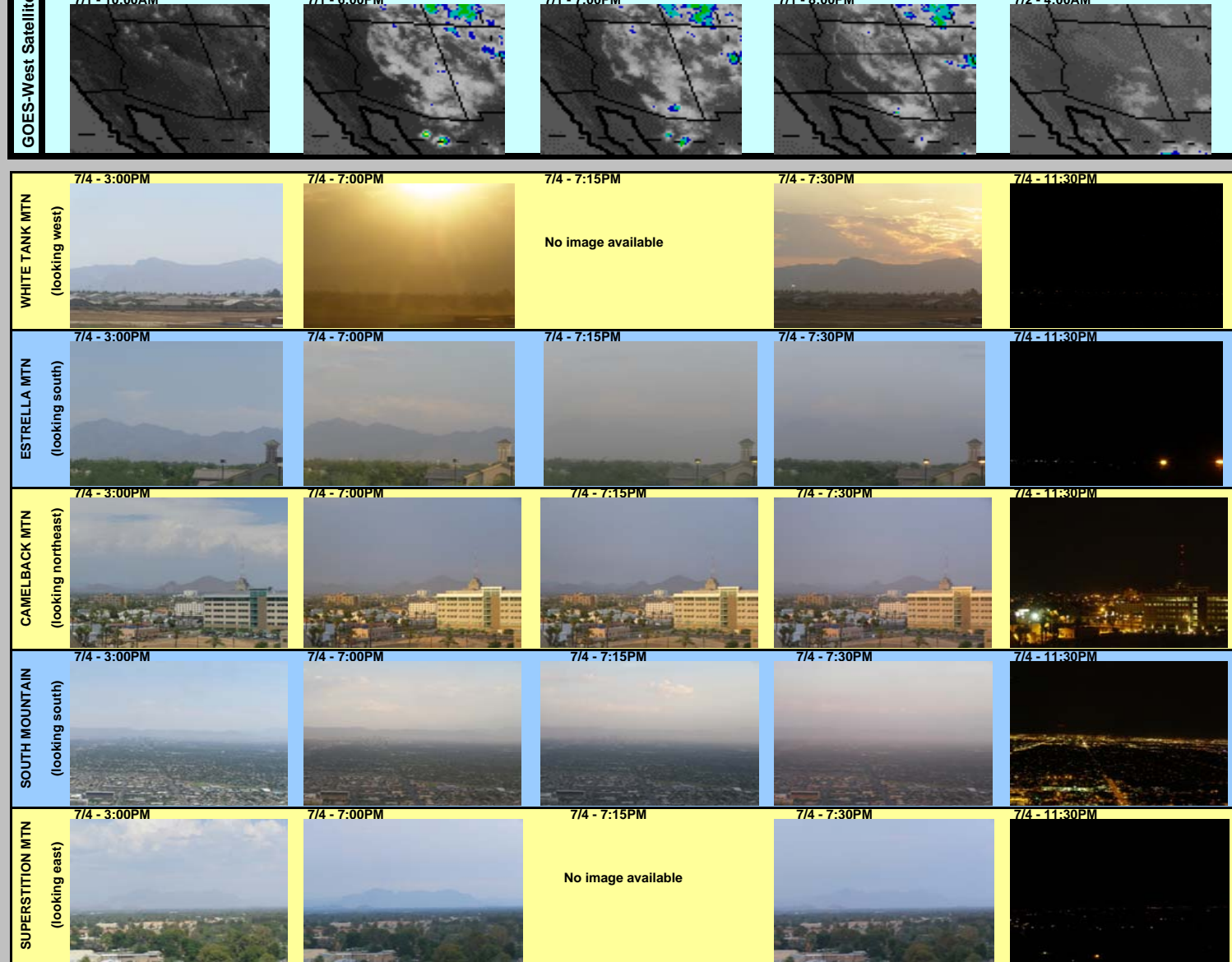
PARKER							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	95	20	-	6	15	S	
2	96	14	-	5	12	NW	
3	94	14	-	8	16	NW	
4	92	15	-	8	16	NW	
5	91	15	-	10	18	NW	
6	91	14	-	13	20	NW	
7	90	17	-	10	16	NW	
8	90	23	-	9	9	N	
9	97	17	-	6	10	N	
10	99	23	-	5	9	W	
11	102	19	-	4	6	S	
12	104	21	-	4	6	S	
1	107	17	-	4	6	S	
2	111	12	-	4	6	S	
3	111	19	-	4	5	S	
4	108	26	-	5	7	S	
5	105	28	-	6	10	S	
6	100	34	-	6	9	S	
7	98	41	-	5	7	S	
8	93	44	-	5	7	S	
9	89	39	-	6	7	S	
10	88	36	-	6	8	S	
11	88	33	-	7	9	S	
12	89	26	-	7	9	S	

SOUTHEAST PHOENIX							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	89	27	-	4	6	E	
2	92	22	-	6	9	E	
3	91	23	-	6	9	E	
4	81	43	-	3	6	SE	
5	79	46	-	3	4	SE	
6	77	55	-	2	3	S	
7	85	40	-	3	8	E	
8	91	34	-	7	11	SE	
9	93	36	-	6	11	SE	
10	95	34	-	5	9	SE	
11	98	30	-	5	11	SE	
12	101	26	-	4	9	S	
1	102	24	-	3	8	S	
2	105	19	-	3	7	NE	
3	106	21	-	3	8	NW	
4	103	26	-	5	8	NW	
5	102	25	-	7	22	N	
6	102	16	-	16	28	E	
7	96	22	-	10	23	E	
8	87	35	-	4	7	SE	
9	85	38	-	2	6	S	
10	83	39	-	4	7	SE	
11	82	41	-	4	6	S	
12	83	37	-	4	12	SE	

MARICOPA							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	87	33	-	3	11	S	
2	87	33	-	1	4	S	
3	83	44	-	4	7	SW	
4	82	41	-	2	5	NW	
5	80	42	-	2	5	E	
6	81	39	-	3	4	S	
7	83	40	-	1	4	NW	
8	89	32	-	1	4	SW	
9	97	23	-	8	12	S	
10	98	21	-	6	11	S	
11	100	22	-	6	11	S	
12	102	19	-	6	11	SW	
1	105	16	-	5	8	SW	
2	107	14	-	5	11	SW	
3	109	13	-	7	14	W	
4	109	13	-	9	17	W	
5	110	12	-	7	15	NW	
6	104	15	-	14	21	NE	
7	100	16	-	15	26	E	
8	95	21	-	9	15	E	
9	93	23	-	7	11	SE	
10	91	25	-	7	13	S	
11	92	24	-	7	11	SE	
12	90	26	-	6	10	S	

Historical Distribution			
5-Yr. Dist. of Values (µg/m ³)			
MONITORS:	Column Index		
1-BUCKEYE	Yr	- All Data (5-Yrs)	
	Sea	- Data for Summer season only (5-Yrs)	
Cum. Freq.	Mon 1		
	Yr		
	Sea		
	5	14	
	0.5%	7	15
	1.0%	9	15
	2.5%	13	17
	5%	16	21
	10%	22	25
	25%	33	34
	50%	48	49
	75%	67	68
	90%	83	86
	95%	98	101
	97.5%	120	115
	99.0%	159	131
	99.5%	260	155
	Max	289	195
Flagged Value	172		

Conclusion: Flagged Value is exceptional in nature (ie greater than 95% of all data)



YUMA							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
02-YumaValley	1	83	39	-	4	6	S
	2	85	33	-	2	6	S
	3	84	31	-	2	5	SW
	4	82	36	-	3	8	W
	5	78	42	-	2	5	SE
	6	76	45	-	4	7	SE
	7	78	43	-	3	6	S
	8	84	48	-	4	9	SW
	9	90	49	-	6	9	S
	10	94	36	-	5	10	S
	11	99	23	-	4	9	SW
	12	102	18	-	4	8	W
1	106	14	-	4	9	W	
2	108	14	-	6	11	W	
3	110	12	-	5	11	SW	
4	111	12	-	4	13	W	
5	112	12	-	6	10	W	
6	111	13	-	6	10	SW	
7	109	14	-	4	7	SW	
8	102	18	-	3	5	S	
9	94	37	-	4	5	SW	
10	91	44	-	4	12	W	
11	90	44	-	5	9	W	
12	85	52	-	3	6	SW	

Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM₁₀ readings from the Buckeye monitor were valid for July 1st. Audits of the analyzers revealed operations were within acceptable tolerance. No local sources were reported as significantly contributing to the air quality episode. An exceedance of the NAAQS was recorded at the Buckeye monitor operated by Maricopa County.

2. Review suspected contributing sources. The NWS and AzMET surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation of the meteorological conditions that were in place on July 1st. Strong northeasterly winds associated with a thunderstorm outflow boundary occurred in the Phoenix area for a short time period between the 4:00 pm and 9:00 p.m. hours. Winds gusted between 20 and 50 mph at various Valley locations during that time period causing spikes in PM₁₀ concentrations at multiple monitoring sites around the Phoenix area between 6:00 p.m. and 7:00 p.m. A large spike in PM₁₀ concentrations occurred at that same time in Buckeye, which led to the NAAQS exceedance.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the “Historical Distribution” Table in Figure 1 has been included to demonstrate that the event is associated with measured concentrations in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). Monitors with readings greater than that of the NAAQS on July 1st, 2008, which should be flagged, include the Buckeye monitor.

4. Examine the meteorological conditions before and during the event. The AzMET meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. The Buckeye AzMET station experienced hourly max wind speeds greater than 15 mph between 7:00 p.m. and 8:00 p.m., with a maximum gust of 29 mph during this time. The Luke AFB NWS

station reported a wind gust of 37 mph and the Deer Valley NWS station reported a gust of 49 mph. Both stations reported reduced visibility with blowing dust and/or haze during that same time period (see Fig. 1). The timing of the reduced visibilities and wind gusts correspond to the onset of elevated PM₁₀ concentrations recorded at Buckeye.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM₁₀ concentrations in the Buckeye area can be attributed to soil emissions that were transported over a broad area. No source-specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on July 1st. Observational reports of blowing dust from trained officials in the Phoenix area, along with reduced visibility, provide further proof that the elevated PM₁₀ concentrations in Buckeye were attributed to soil emissions. These reports, in addition to the visual evidence of reduced visibility (most clearly seen in the 7:00-7:30 p.m. images located in the lower right portion of figure 1) provide proof that elevated PM₁₀ concentrations in and around Phoenix are attributable to soil emissions. The movement of the outflow boundary from the northeast toward the southwest through the Phoenix and Buckeye areas is also apparent in the 7:00-8:00 p.m. satellite images located in the right-center portion of Figure 1.

6. Estimation of Contribution from Source or Event. The primary source appears to be wind-blown dust over central Arizona for which there is not an effective or efficient method to estimate the relative contributions from specific sources. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying a 40 CFR 50.14(c)(3)(iii)(B) requirement. Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the “Event Contrib. Analysis” Table in Figure 1 has been included to demonstrate that there would have been no exceedances or violations but for the event (i.e., the contribution during the event overwhelmed the 24-hour averages).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentrations at the Buckeye monitoring site was attributed to a natural event.

Conclusion

Long-range transport of dust from soils. The region wide elevated PM₁₀ event on July 1, 2008 in Maricopa County was the result of the transport of dust and soils from winds that suspended natural soils and soils from areas where Best Available Control Measures are in place and should

be flagged for air quality planning purposes. The “high wind” flag (A or RJ) should be applied to the monitor readings indicated in the table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.